CONFIDENTIAL

50039

February 3, 1970

Declass Review by NGA.

25X1 [redacted]

Post Office Box 8274
Southwest Post Office
Washington, D. C. 20024

Dear Sir:

In accordance with your request [redacted] is pleased to submit our proposal P-325F for modification of five chip comparators. This proposal consists of a technical proposal and a firm fixed price quotation. 25X1

The delivery of the first system modification will be ten weeks ARO. Delivery of the remaining four systems will be seven weeks after delivery of the first system.

This fixed-price quotation remains valid for sixty days.

25X1
25X1

If you have any technical questions regarding this proposal please contact myself, or [redacted]
Any contractual questions can be referred to [redacted]

25X1 [redacted]

Sincerely,

25X1 [redacted]

Acting General Manager

JTK:dr
Encl.

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GROUP 1
EXCLUDED FROM AUTOMATIC
DOWNGRADING AND DECLASSIFICATION

CONFIDENTIAL

C-072-70

25X1

[redacted]

P-325C

A Proposal for

MODIFICATIONS TO THE [redacted] CHIP COMPARATOR 25X1

25X1

[redacted]

25X1

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[redacted]

P-325 C

A Proposal for

MODIFICATIONS TO THE [redacted] CHIP COMPARATOR

25X1

May 1969

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LIST OF ILLUSTRATIONS

Approved For Release 2005/05/20 : CIA-RDP78B04770A001700060021-6

25X1

[redacted]

I. INTRODUCTION

25X1 [redacted] is pleased to submit this proposal, P-325C, for modifi-
25X1 cations to the [redacted] Chip Comparator. [redacted] proposes modifica- 25X1
tions to correct a lamp burn-out and water damage problem and also, a drive mechanism for the optical head to correct several deficiencies in the present drive.

A schedule of the proposed effort is shown in Figure 1.

II. STATEMENT OF THE PROBLEM

To ensure proper operation of the interferometer-type stages (X and Y) requires cooling of the lamp. The present system uses a closed-circuit water cooling system consisting of a pump, coil around the lamp, and a reservoir of water. Water leakage occurs around the water heater seal entering the reservoir. After a period of time, the water level of the reservoir drops to a point where no water is being pumped through the cooling system; therefore, the lamp temperature rises and eventually the lamp burns out. At the same time, the water that has leaked out of the reservoir penetrates the electrical system (relays, cables, fuses, etc.) causing the fuse to blow, thereby disabling the system.

Water penetration of the electrical system requires that the machine be disassembled and completely cleaned. Replacement of some components may be necessary.

Another problem area concerns itself with the drive mechanism for the optical head. The present drive consists of worm-speed reducer and spur gear driving a rack gear which is attached to the optical head support bracket. Two dovetail joints are employed to guide the 15-pound optical head. This arrangement enables one to move the optical head up and down for focusing.

A dovetail is normally used as a guide to position an object and then clamp it in place. Clamping of the optical head after positioning is an inadequate operational arrangement for an optical comparator inasmuch as it effects

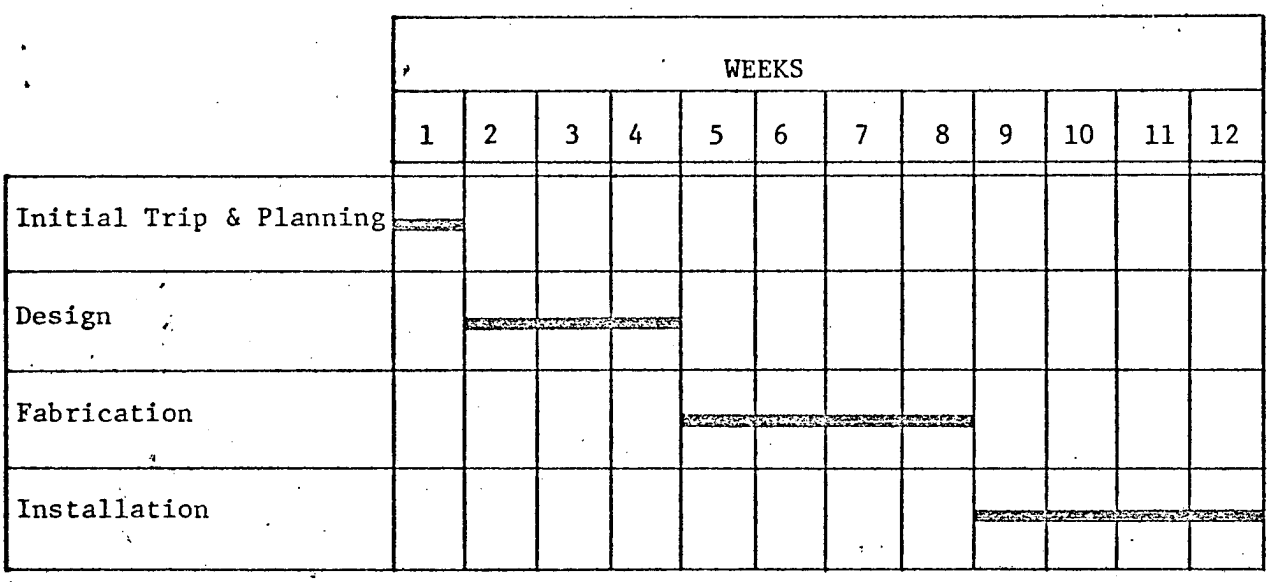


Figure 1

PROPOSED SCHEDULE

25X1

[redacted]

focusing. If the dovetails are shimmed to eliminate excess clearance and clamping, it becomes difficult to move the optical head. The present arrangement does not employ precision anti-backlash gearing. The lack of any anti-backlash gearing is responsible for some of the focusing difficulties.

III. PROPOSED MODIFICATIONS

A. SENSORS

25X1 [redacted] proposes to install pressure sensors on the output of the pump to detect a pressure decrease or increase in the water system. When a decrease or increase is detected due to leakage, blockage or evaporation, an indicator lamp illuminates, thereby indicating what stage (X or Y) has failed, and the power is also removed from the high-intensity lamp. The indicator light aids maintenance personnel in determining what stage has failed. When the sensor energizes its respective relay; indicator lamps indicate L or R failure and power to the L or R high-intensity lamps is removed. Initial turn on of system power will energize the pump and when suitable pressure is reached the high-intensity lamp is energized. A schematic diagram of this circuit is shown in Figure 2.

B. ENCLOSURE

25X1 [redacted] proposes to fabricate an aluminum-alloy enclosure for the water reservoir. The enclosure will collect any leakage and prevent it from penetrating the electrical system. Figure 3 shows the enclosure.

25X1 In addition, [redacted] will inspect the water cooling hoses and attempt to improve the seal between the hose and the water heater seal where the main source of water leakage occurs.

C. OPTICAL HEAD DRIVE

25X1 [redacted] proposes to eliminate the present gear drive and dovetail guides and replace this with a new design shown in Figure 4. The key elements of this design are two precision miniature ball screws. The screws are housed in a precision-machined bracket which will attach to the Optical Comparator Arm. Miter gear sets coupled to a worm-speed reducer drive the ball screws. The gear drive uses anti-backlash gears throughout to eliminate backlash. Precision

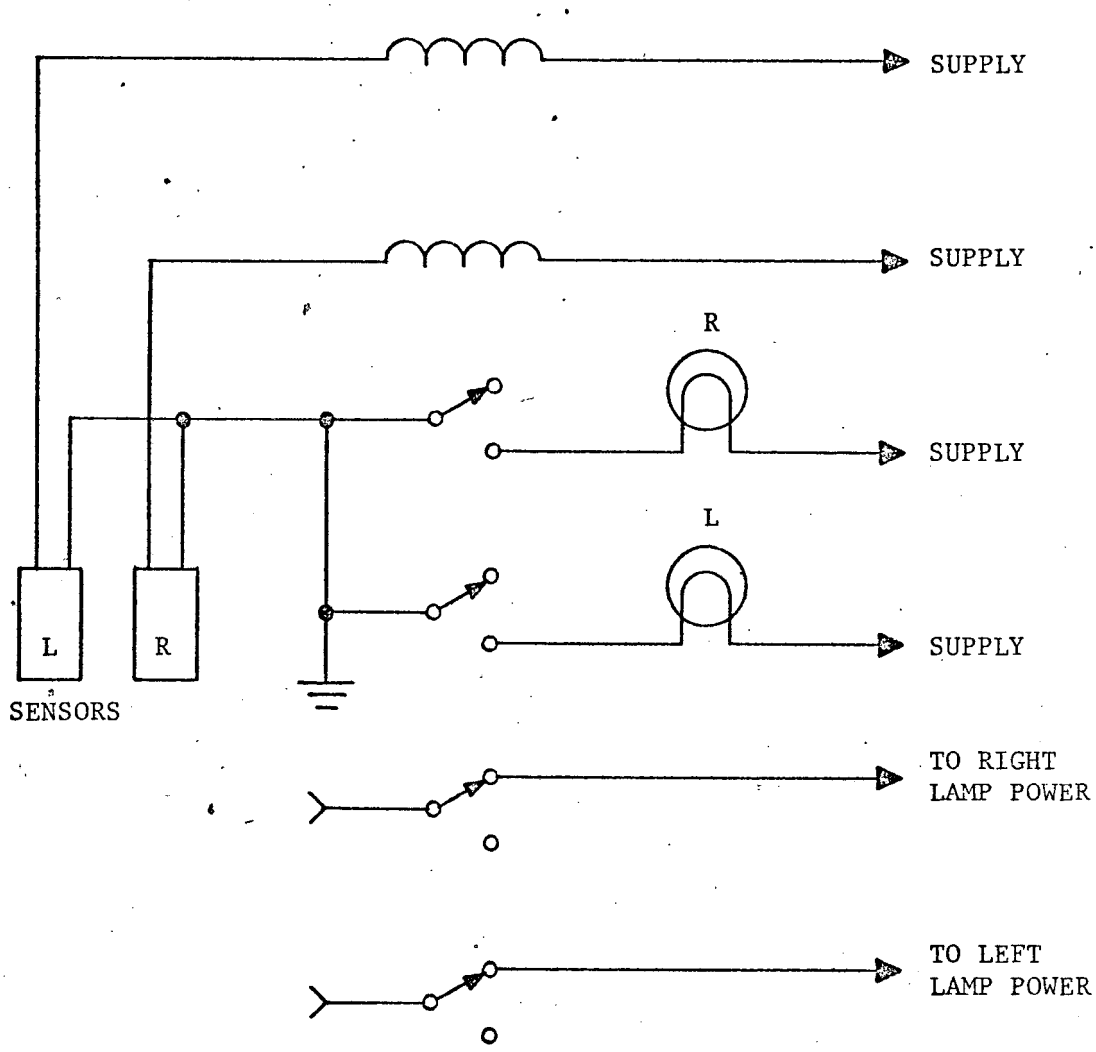


Figure 2

MODIFICATIONS SCHEMATIC

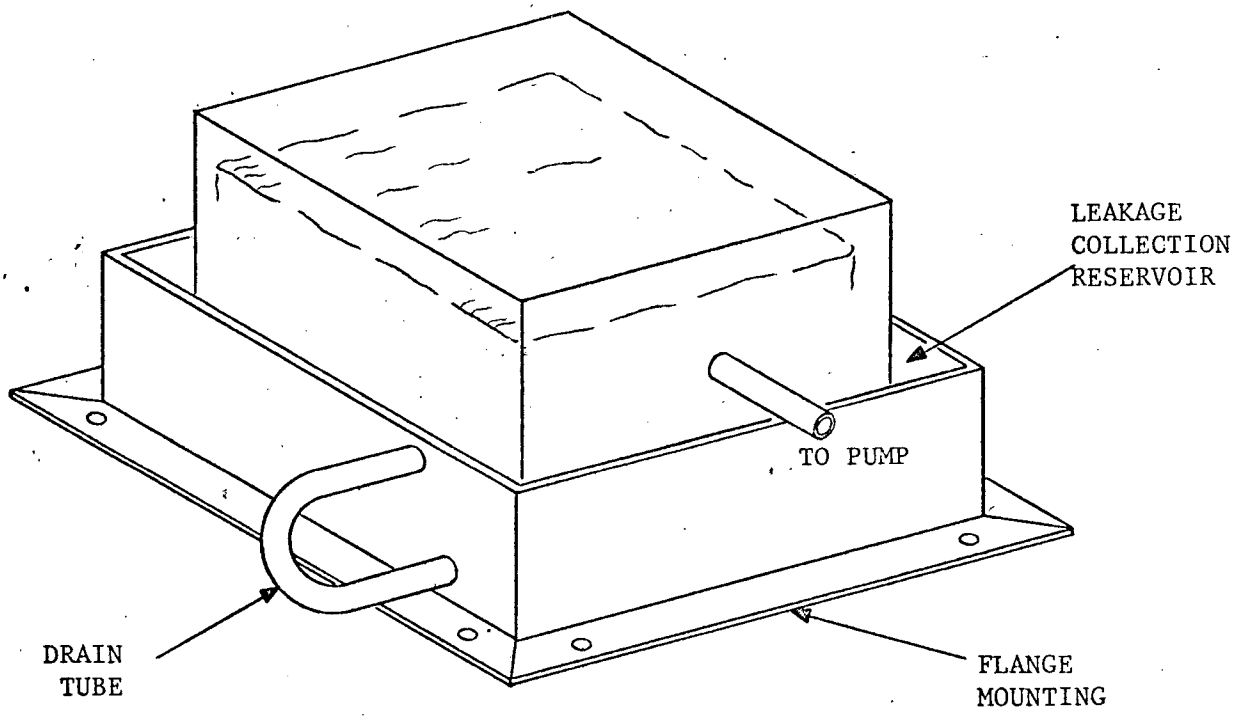
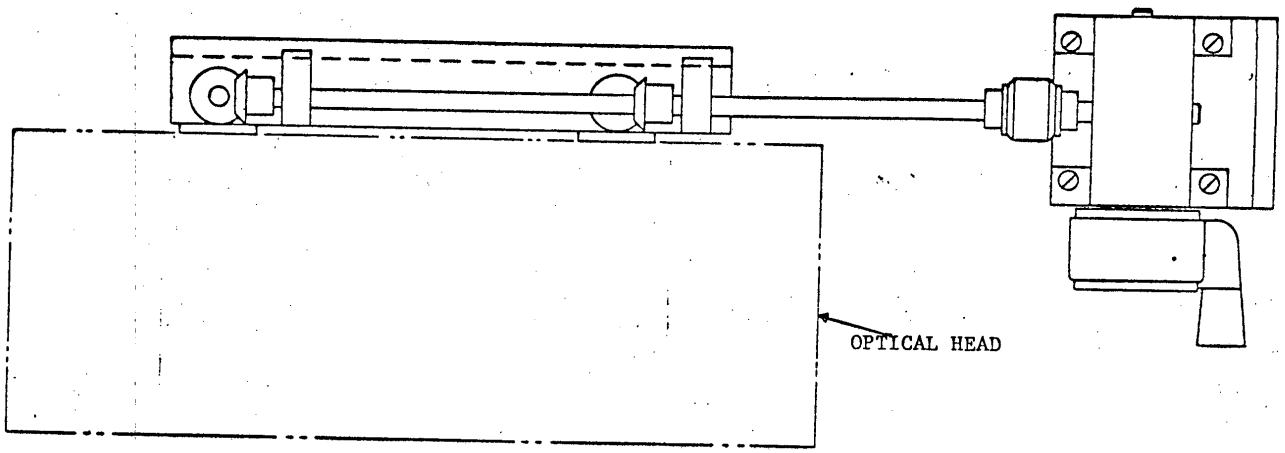


Figure 3

ALLUMINUM-ALLOY ENCLOSURE



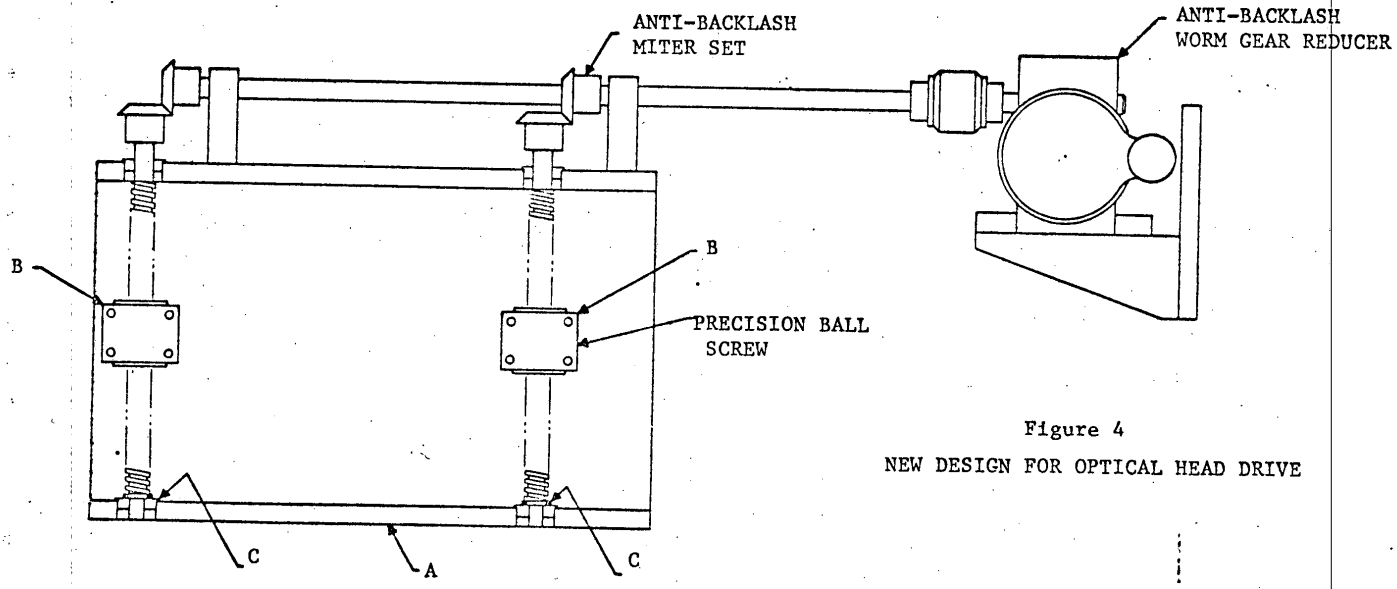


Figure 4

NEW DESIGN FOR OPTICAL HEAD DRIVE

bearings having ABEC-7 tolerances are used.

The gear ratio of the gear drive is 40:1, and the ball screw has a lead of 0.100 inches. Therefore, every full 360-degree-turn of the handwheel on the worm-speed reducer will result in a 0.0025-inch movement of the optical head.

The ball screw, which is important to the accuracy of this system, has a tolerance of 0.0002 inches/inch on the screw. This amounts to an error of 30 seconds between the two screws. Obviously, we cannot accept this error. One solution is to employ a greater precision ball screw (0.0002 inches/foot). This is prohibitive from a cost standpoint (10 times greater). An easier solution follows: (See Figure 4)

First, we assemble the ball screws and gear drive to the bracket and then place surface A, of the bracket, on a surface table. Next, using a height guage with dial indicators to measure the precision-machined mounting/ball nut at point B, we measure and compute the differential at several points along the ball screws. After averaging the differential, appropriate thickness shims can be used at point C for correction. Then, the optical head mounting bracket can be attached and similarly aligned and pinned in place. When the assembly is installed on the Optical Comparator, a similar alignment technique can be employed. The height gauge will be located on the comparator optical plates.

In summary, the proposed system will provide a free, easy non-binding drive with a high-resolution capability. Also, using the method of measurement and alignment proposed, we believe that the optical head mounting surface can be held level within 0.0002 inches. This would amount to four arc seconds between the two ball screws.

IV. INSTALLATION AND TESTING

The proposed effort includes installation of the modifications at the Customer facility. Some portions of one mechanism will be required by [redacted] 25X1

25X1 [redacted] to facilitate design and fabrication of the modification kits.

Installation includes alignment and debugging as necessary to make the modifications an operable portion of the overall machine.